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ABSTRACT

The characteristics of schools defined as having low, medium, and high poverty concentration are examined. The following variables are examined for elementary schools: (1) school climate; (2) compensatory education related characteristics; (3) demographic characteristics; (4) student mobility; and (5) reading and math achievement. The following variables are examined for high schools: (1) school climate, specifically school misbehavior; (2) participation in Title I; (3) demographic characteristics; (4) reading and math achievement; and (5) dropout rates. Students enrolled in elementary and high schools with high concentrations of poverty are more likely to be Black or Hispanic, speak a language other than English, and have low achievement. The principals of these schools are more likely to report that student behavior is problematic than principals in low concentration of poverty schools. Students in high poverty concentration schools generally have lower achievement than those in low concentration schools even after taking into account student and family characteristics. However, achievement appears to increase at the same rate in both types of schools. Other than for students in the early grades, attending a school with a high concentration of poverty will not necessarily put a student further behind in achievement than his or her peers in low concentration schools; however, students in high concentration schools will continue to fall behind their peers in schools with relatively few students living in poverty. Data are presented on 14 tables and figures. A list of references is provided. (BJV)

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The Relationship Between School Poverty Concentration and Students' Reading and Math Achievement and Learning

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Introduction

This report serves two purposes. The first is to describe the characteristics of schools with low, medium, and high poverty concentration. The second is to present research that examines the relationship between school poverty concentration and students' achievement and learning. This relationship provides the conceptual underpinnings of Chapter 1 and its predecessor, Title I. Because of the presumed close tie between poverty concentration and achievement, and because of the availability of poverty statistics for states, school districts, and schools, poverty concentration serves as the primary mechanism by which funds are directed to serve students with low educational achievement.

In the past, many studies have reported on the "poverty-educational achievement" relationship. Most have examined the relationship between family poverty and educational achievement. Results from this line of research have generally documented that students from families with limited material resources have poor educational achievement (see, for example, Jencks et al., 1972). Relatively few studies have focused on the relationship between school poverty concentration--percent of schools' student body living in families with incomes below the official poverty threshold or a modification of this index--and students' educational achievement. Most studies analyzing the importance of family characteristics aggregated at the school level have examined the effect of school socioeconomic status (e.g., average parental education, average family income) on student's achievement. Few have attempted to actually estimate the relationship between school poverty concentration and educational achievement. Those that have are generally flawed for at least two reasons. First, much of the past research has attempted to estimate the relationship with aggregated school achievement scores. As shown in the research literature, the relationship between two variables measured at the group level can be partly attributed to the

aggregation process and does not necessarily reflect the relationship between school poverty concentration and students' achievement. As an example, we draw on research by Wolf (1977). Wolf's data shows that as the unit of analysis increases from the student to the school district, the correlation between poverty and educational achievement increases. Using student level data the correlation is about .3, at the school level it increases to .5, and using school districts as the unit of analysis the correlation increases to nearly .6. When attempting to determine the relationship between poverty concentration and achievement the analyst is left in a quandary as to what the true correlation is between school poverty concentration and students' achievement.

The second limitation of most research on this topic is the use of simple correlation coefficients to describe the relationship between poverty concentration and educational achievement. The correlation coefficient only reveals the extent to which poverty and achievement covary with one another, assuming a linear relationship. A correlation coefficient does not show the differences in students' achievement that result from students being in schools with high and low poverty concentration. For example, an analyst could observe a relatively small correlation between school poverty concentration and achievement and a large difference in achievement between students in high and low concentration schools. On the other hand, a large correlation and a relatively small effect (difference) may be observed.

In the research reported here, each of these limitations is taken into account. A statistical model is specified that allows estimation of the relationship between schools' poverty concentration and students' achievement. This model is based on a set of parameters that show the predicted difference in students' achievement scores who are in high and low concentration schools. An added feature of this model is that the effects of school poverty concentration on both achievement and learning can be

estimated. Most previous research has focused on achievement and not learning. Learning is defined in this report as changes in achievement over time.

The specific questions addressed in the research reported here are the following:

1. To what extent do characteristics of schools differ by level of school poverty concentration?

2. What is the effect of school poverty concentration on reading and math achievement and learning when no other family and student characteristics are taken into account? That is, to what extent are there differences in reading and math achievement and learning of students from schools with low and high poverty concentrations?

3. What is the relationship between school poverty concentration and students' achievement and learning once student and family characteristics are taken into account?

4. Does the effect of school poverty concentration on students' achievement and learning depend on grade level?

Significant results of these analyses are as follows:

- Schools with high poverty concentrations tend to have low average reading and math achievement scores; high dropout rates; disciplinary problems; high student mobility rates; a large proportion of the student body speaking a language other than English; and a relatively even mix of white, black, and Hispanic students.

- There is a significant, negative effect of school poverty concentration on reading and math achievement at most grade levels.

- The effects of poverty concentration on learning (change in achievement over time) are generally insignificant, except in the early grades.

- For elementary school students, the impact of school poverty concentration on achievement increases between grades 1 and 6.

The remainder of this report first describes the data and the construction of the variables used in the analyses. Second, the characteristics of low, medium, and high poverty concentration schools are presented. Third, a conceptual model for estimating the relationship between school poverty concentration and achievement and learning is discussed. The discussion includes a description of the variables that are included in

the model and their hypothesized effects on students' achievement. Fourth, the results of the analysis of the relationship between poverty concentration and students' achievement and learning are reported. Finally, the results are summarized and possible implications of the findings are discussed.

Data and Variable Descriptions

Two data bases are used in the analyses described here: (1) the Sustaining Effects Study data base (SES) and (2) the High School and Beyond data base (HS&B). The SES is a nationally representative sample of elementary school students. It contains detailed information on parental and family characteristics (e.g., family income, poverty status, parental education, number of siblings, race/ethnicity) for 15,000 elementary school students. This is a subset of a much larger survey that collected data on more than 100,000 elementary school students (see, for example, Hoepfner, Wellesch, and Zagorski, 1977; Hemenway, Wang, Kenoyer, Hoepfner, Bear and Smith, 1978). Every student in the sample was administered a reading and math achievement test in the fall and spring of each year for up to a three year period beginning in 1976. Students who were in grades 1 to 4 in the first year of the survey were administered a total of six achievement tests. Students in grade 5 during the first year of the survey were followed for two years and were administered four achievement tests. Finally, students in grade 6 during the first year of the survey were followed for one year and were administered only one fall and one spring achievement test. In addition to collecting information from students and their parents, data were also collected from principals and teachers in each students' school. A detailed description of the variables used in our analyses appear in Table 1. In addition, univariate statistics for each of the variables are provided.

The analysis of the relationship between poverty concentration and secondary school students' achievement and learning is based on data from the HS&B. HS&B is a nationally representative survey of 25,000 high school sophomores (NCES, 1983). (Both sophomore and senior students are a part of the larger HS&B data base. However, only sophomores were administered achievement tests during two periods of time and thus, we focus on this cohort of students.) During the base year of the survey (1980) students were administered questionnaires that collected information on family background and student characteristics (e.g., family income, parental educational attainment, number of siblings, race/ethnicity), parent's aspirations for students, student's plans, self-reported grades, and course taking. Each student was administered a battery of achievement tests, including tests in reading and math achievement. A detailed assessment of the tests is reported in Hilton and Heyns (1982). In 1982, the sophomore cohort was again administered achievement tests and asked to provide information on characteristics and attitudes similar to those obtained during the 1980 survey. A detailed description of each of the variables used in the analyses is presented in Table 2 along with summary statistics of the variables.

It is anticipated that the estimates derived from the high school sample will be attenuated to a greater degree than those from the elementary school sample. The high school data refer to parental and family characteristics reported by students. Similar data for the elementary school aged sample of students were obtained directly from the parents. Thus, greater measurement error in the variables is expected in the high school sample than the elementary school sample, and in turn, greater attenuation of the parameter estimates. The extensiveness of measurement error in the HS&B data has been investigated by Rosenthal, Myers, Milne, and Ellman (1983).

Descriptive Analysis of the Characteristics of Low, Medium, and High Poverty Concentration Schools

This section examines the characteristics of schools defined as having low, medium, and high poverty concentration. Separate results are presented for elementary and secondary schools. For purposes of this analysis, low, medium, and high concentration schools are defined as those that are in the lower quartile (less than 25 percent), two middle quartiles (25 percent to 75 percent), and the upper quartile (greater than 75 percent) of the distribution of schools by percent of students in poverty. Separate distributions are used for the elementary and secondary schools. For elementary schools, those with less than 7 percent of their students in poverty are classified as low poverty schools, those with 7 percent to 24 percent are defined as medium poverty schools, and schools with more than 24 percent of their students in poverty are classified as high concentration schools. Among high schools, those with less than 10 percent of their student body living in poverty are assigned to the low poverty category, those with 10 percent to 30 percent are classified as having medium poverty concentration, and those with more than 30 percent are defined as high poverty concentration schools.

Characteristics of Elementary Schools

Table 3 presents the results for elementary schools. There are five general classes of variables shown in Table 3: (1) school climate, (2) compensatory education related characteristics, (3) demographic characteristics, (4) student mobility, and (5) average reading and math achievement levels of schools.

School climate. Principals' reports about vandalism and violence are used to measure school climate. When principals are asked about the "climate" in their schools, those in high concentration schools are more likely to report that their schools have problems than principals in low and medium concentration schools. While the

differences in responses for principles in low, medium, and high concentration schools are not large, they do follow a consistent pattern: high concentration schools are reported to have the greatest problems in terms if vandalism and physical violence, followed by medium and low concentration schools, respectively.

Compensatory education. Characteristics pertaining to the provision of compensatory education services are related to poverty concentration, as would be expected. For example, nearly 81 percent of the schools that have high poverty concentration are also classified as Title I schools, while 44 percent of the low concentration schools are similarly classified. Medium concentration schools fall between these two extremes. Among high concentration schools it is observed that about 11 percent are defined as "other CE schools" while 37 percent of the low concentration schools have this classification. Only 8 percent of the high poverty concentration schools have no compensatory education services. Among medium and low poverty concentration schools, 11 and 19 percent, respectively, have no compensatory education services. The variables measuring percentage of students receiving Title I reading and math services in a school show that high concentration schools provide higher percentages of their student body with reading and math services than low concentration schools. For example, on average, in low concentration schools only 7 percent of students receive Title I reading and 22 percent of all students in high concentration schools receive Title I reading services.

Demographic characteristics. The demographic characteristics of schools refer to racial and ethnic mix and the percentage of students who speak a language other than English. Examination of the race/ethnicity of schools shows that in high concentration schools, 53 percent of the student body is white, 32 percent is black, and 12 percent is Hispanic. Larger variability in the race and ethnic mix is observed in low and medium concentration schools than high concentration schools. Both low and medium poverty

concentration schools are more likely to have high concentrations of white students and a small fraction of blacks and/or Hispanic students than schools with a high proportion of the student body in poverty. With respect to the percentage of students who speak a language other than English, it is observed that low concentration schools are somewhat more likely to have a small percentage (6 percent) of their students speaking a language other than English than medium (11 percent) and high concentration schools (19 percent).

Student mobility. The student mobility rates reported here refer to the sum of the percent of students entering a school and the percent of students leaving a school during the school year. Comparing student mobility in low, medium, and high concentration schools shows that high concentration schools have mobility rates that are nearly twice that of low concentration schools (23 percent versus 14 percent) and slightly higher than medium concentration schools.

Reading and math achievement. The last characteristic of elementary schools examined is mean reading and math achievement, by grade during the first year of the SES survey. Across all grades for both reading and math achievement it is apparent that low concentration schools have, on average, higher reading and math achievement scores than schools with high poverty concentration. A common procedure for assessing this relationship is to correlate poverty concentration with mean achievement. In doing so, one usually observes a correlation of about -.5 (see, for example, Wolf, 1977). This shows that knowledge of schools' poverty concentration allows the analyst to account for about 16 percent of the variation in school achievement. For the elementary schools analyzed here, the proportion of the variation in reading and math achievement that can be accounted for by knowing school poverty concentration ranges from .10 to .35, and thus is in line with previous findings.

Characteristics of High Schools

In Table 4 results are presented for a nationally representative sample of high schools. With the exception of student mobility, the variables are comparable to those used for elementary schools: they are school misbehavior, participation in Title I, demographic characteristics, and reading and math achievement and rates of dropping out of high school.

School climate. The indicators of school climate as reported by principals refer to problems in a school related to physical conflicts among students and teachers, robbery and theft in schools, cutting classes, and student absenteeism. Examination across all five variables shows that principals in schools with low poverty concentration report that there are generally fewer problems in their schools than principals in high concentration schools. That is, principals in low concentration schools are less likely to perceive that students' behavior (e.g., cutting class, physical violence) is problematic than principals in high concentration schools.

Participation in Title I and related services. While the High School and Beyond does not provide extensive information on compensatory education related services, data are available on whether a school participated in Title I, and the percent of 10th grade students taking remedial reading and math courses. The data show that as poverty concentration increases, there is a corresponding increase in the percent of schools participating in Title I, as expected. More than 71 percent of the high concentration schools responded that they were a Title I school and only 42 percent of the low concentration schools indicated that they participated in Title I. On the average, more than 55 percent of the schools report that they participate in Title I. In addition, schools with high poverty concentration have more than twice the proportion of students taking remedial reading and math courses as do schools with low poverty concentration (22 versus 8 percent).

Demographic characteristics. Regarding the demographic characteristics of schools, it is apparent that high concentration schools tend to have a similar mix of white, black, and Hispanic students, while low concentration schools generally have a large concentration of white students and a relatively small proportion of minority students. In high concentration schools, on average, 40 percent of the student body is white, 28 percent black, and 32 percent Hispanic. In low concentration schools, on average, 85 percent of the student body is white, 5 percent black, and 10 percent Hispanic. High concentration schools also tend to have more students who speak a language other than English than low concentration schools (20 percent versus 6 percent).

Reading and math achievement and dropout rate. The final characteristics examined are average reading and math achievement, and percent of students who drop out of high school. For both sophomores and seniors, students from low concentration schools have, on average, higher reading and math achievement scores. The correlation between achievement and school poverty concentration is about -.60. In other words, by knowing schools' poverty concentration, it is possible to account for 36 percent of the variation in school mean achievement. Finally, schools with a high poverty concentration have dropout rates that are more than twice as large as low concentration schools (15 percent versus 6 percent).

Conceptual Model and Variables

This section first describes the model that is the basis of the statistical analysis of the relationship between school poverty concentration and students' achievement and learning. Second, the variables used in the analysis and their hypothesized effects on achievement and learning are discussed.

The Conceptual Model

To estimate the gross and net effects of poverty concentration on school achievement and learning, a statistical growth model is formulated. The model begins with the following specification:

(1) $A_{itj} = \beta_{0ij} + \beta_{1ij} T_{itj} + u_{itj}$ $(i=1,...,n_j; j=1,...,J; t=1,...,K)$

where A_{itj} refers to the achievement (i.e., "best" reading or math achievement as defined by SDC) of the ith student at time t in the jth school; T=t-1 when K=2, otherwise t is coded in months beginning with 0; u_{itj} is a random error term with $E(u_{itj}) = 0$, and $E((u_{itj}), (u_{itj})) = \sigma^2$ for i = i' and = 0 for i = i'; β_{0ij} corresponds to baseline achievement (i.e., achievement at the time of the first measurement period); β_{1ij} indicates the rate of change in achievement (i.e., learning) between time t and t-1.

This specification of the model assumes that changes in achievement over time occur in a linear fashion. More complicated specifications may be proposed (Strenio, Weisberg, and Bryk, 1983); however, when using only two measurements of achievement for each student as done in many of the analyses described in this report, the linear specification is the most complicated form that can be supported by the data. Further, use of a linear specification considerably simplifies the discussion of the results. A subset of the analyses uses achievement scores obtained at six points in time.

To capture the effects of poverty concentration and other variables on achievement and learning, the relationships between these variables and the two parameters in equation (1) are specified:

(2) $\beta_{0ij} = X_{ij} B_1 + G_j B_2$

(3) $\beta_{1ij} = X_{ij} B_3 + G_j B_4$

where X_{ij} is a vector of student and family characteristics (including a constant, unity) that are assumed to remain constant over time; G_j is a vector of school level variables such as poverty concentration; and B_1, B_2, B_3, and B_4 are conformable vectors of

parameters to be estimated. Using equation (3), it is possible to show that the impact of poverty concentration on learning in a specific subject, such as reading, is equal to B_{4k} where k indicates the specific parameter linking poverty concentration to the learning parameter, r_{1ij}. Thus, for every percentage point change in poverty concentration, it is expected that the rate of learning in a specific subject area will change B_{4k} units.

To determine the effect of poverty concentration on achievement, equations (2) and (3) are substituted into equation (1):

(4) $A_{itj} = X_{ij} B_1 + G_j B_2 + T_{itj} X_{ij} B_3 + T_{itj} G_j B_4 + u_{itj}$.

From equation (4), it can be shown that the effect of poverty concentration on students' achievement is $B_{2k} + T_{itj}B_{4k}$. From the definition of the effect of poverty concentration on achievement, it is apparent that there are three elements that come into play. First is the effect of poverty concentration on achievement during the first measurement period (t=1). Second is the effect of poverty concentration on learning between two points in time, B_{4k}. Third is the length of time between the initial measurement of achievement and the point in time that is of interest, time T.

As already noted, estimates of the gross impact of poverty concentration on students' achievement and learning as well as the net effect are obtained. In estimating the gross effect, all student and family variables from equations (2) and (3) are excluded. The estimates of B_2 and B_4 can then be used to calculate the desired quantities. The gross effects of poverty concentration show the differences in achievement and learning of students in high and low concentration schools when no other variables are taken into account. Thus, the gross effects of school poverty concentration on achievement captures differences in other family characteristics, and student and school characteristics that are associated with being in high and low concentration schools. The net effect of poverty concentration on achievement and

learning can be obtained directly from equation (4). The estimates of the net effects show the extent to which there are differences in achievement and learning attributable to school poverty concentration after the effects of family and student characteristics are statistically held constant.

The parameters in equation (4) are estimated via ordinary least squares. In doing so, a number of assumptions are necessary: (1) the expected value of the errors equals 0, (2) the error variance is equal across all individuals, time periods, and schools, and (3) the errors for each individual across time periods are not correlated with one another. Under these assumptions, unbiased and efficient parameter estimates are obtained. Alternative methods are available; however, provided with both the large number of schools in the samples, students, and independent variables, estimation with the alternative procedures would have been prohibitively expensive.

Analytic Variables

The independent variables included in the statistical analysis are, in general, those that have been observed as significant determinants of students' educational achievement with the exception of school poverty concentration. Poverty concentration is discussed first, followed by a discussion of the student and family variables that are included in the statistical analysis.

- School poverty concentration. Students in schools with high poverty concentrations are expected to have lower achievement and to learn at a slower rate than students in schools with low levels of poverty concentration. This hypothesis is indirectly derived from research that shows that students in schools with low average family socioeconomic status tend to have low achievement scores (see, for example, Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, and York, 1966). Coleman and his associates conclude from their analysis of the EEOS data that school socioeconomic status has more of an effect on achievement than all other variables, except for family socioeconomic status. Other studies have reached similar conclusions. For example, McPartland and York (1967) found in their reanalysis of the EEOS data for ninth grade blacks that even after they statistically held constant family socioeconomic status and classroom composition,

there was a positive relationship between school socioeconomic status and verbal achievement. While much attention has been devoted to general concepts of school socioeconomic status, much less attention has been focused on poverty concentration in schools and its consequences. However, a study by Wolf (1977) concludes that the correlation between school level poverty and students' achievement is about -.5. Unfortunately, Wolf did not attempt to take into account other variables that may have been correlated with both poverty concentration and students' achievement. While Wolf's results indicate a strong relationship between school poverty concentration and achievement, Jencks et al. (1972) report that differences in economic affluence of families in schools tends to have only small effects on actual test performance.

- Student's gender. It is hypothesized that elementary school-aged girls will perform at a higher level in both reading and mathematics than boys (see, for example, Fennema, 1974; Fennema and Sherman, 1977). By the time they reach high school, though, we expect to find that boys have higher levels of performance than girls, particularly in mathematics. This cross-over may be due in part to differences in socialization processes and course taking practices experienced by boys and girls as they move through the educational system.

- Student's race and ethnicity. Previous research has shown that white students have higher achievement and learn at a faster rate than black students (see, for example, Jencks et al., 1972). While much less research has focused on differences in achievement and learning of Hispanic children, we anticipate that these youth will tend to score between white and black students (see example, Myers and Milne, 1983; Okada, Cohen, and Mayeske, cited in Mosteller and Moynihan, 1972).

- Number of parents in a student's family. Much attention has been devoted to assessing the effects of being from a single parent family on students' school performance (see, for example, Hetherington, Camara, and Featherman, 1981). Reviews of the research literature generally conclude that the results are mixed. This lack of consistency may be partly attributed to differences in methods and conceptualization of the processes linking single parent status to educational outcomes. Based on research by Milne, Myers, Rosenthal, and Ginsburg (forthcoming) and Myers, Milne, Baker and Ginsburg, (1985) it is expected that students in single parent families will have lower achievement than those from families with two parents present. Analysis of the impact of being from a single parent family on learning shows that weak, but generally negative effects should be expected (Myers et al., 1985). The observed relationship between being from a single parent family and poor school performance may be in part due to low family income, high levels of stress in the household, and less parental time to manage children's activities.

- Maternal work. Maternal work has been observed to have differential effects on education related outcomes (see, for example, Heyns, 1982). Heyns concludes from her review of the research literature that achievement related outcomes are largely unrelated to maternal employment. However, recent research using the two data bases employed here (i.e., Sustaining Effects and High School and Beyond) suggest that maternal work has a negative effect on students' achievement (Milne et al., forthcoming; Myers et al., 1985). Thus, it is anticipated that a negative relationship between our measure of maternal work, and achievement and learning will be observed.

- Family socioeconomic status. The research literature addressing the effects of family socioeconomic status on school performance is vast and it is generally accepted that students from families with high socioeconomic status perform at higher levels than similar students who reside in families with low socioeconomic status (see, for example, Konstant and Apling, 1984; Jencks et al., 1972; Coleman et al., 1966; Milne et al., forthcoming). However, as shown by Myers et al. (1985), the effects of family socioeconomic status on learning are not as consistent as those on achievement. However, in most instances a positive relationship is observed, particularly for white males and females. In this research two measures of family socioeconomic status are used: (1) mother's educational attainment and (2) whether a student's family lives in poverty. It is expected that students from families with a mother with high educational attainment or from families who have high incomes will be in an environment where education is valued, there are high educational attainment expectations for youth, and other intellectual and material resources will be available that will facilitate high achievement and learning rates.

- Number of siblings. For students from families with a large number of siblings, it is hypothesized that there will be fewer intellectual and material resources available to each child in the household than for students with few siblings, and in turn, they will have lower achievement and rates of learning (Zajonc, 1976).

- Language minority status. Over the past 20 years, research has shown that language minority youth generally do not perform as well on achievement tests as native English speaking students. Recent analyses of the Sustaining Effects Study data (Rosenthal, Baker, and Ginsburg, 1983) and High School and Beyond data (Myers and Milne, 1983) confirms these findings. Much of the difference in achievement between language minority students and English only students is attributable to differences in family socioeconomic status; however, almost 50 percent of the difference for the two groups is not accounted for by socioeconomic status (Rosenthal et al., 1983). Rosenthal et al. also conclude that reading achievement is more strongly influenced by being a language-minority student than is math achievement and that the

effect of language on reading and math learning is either weak or inconsistent. Thus, it is anticipated that non-native English speaking students will have low achievement and perhaps, learning.

Effects of Poverty Concentration on Students' Achievement and Learning

In this section the gross and net effects of school poverty concentration on elementary and secondary school-aged students' achievement and learning are described. The gross effect refers to the impact of poverty concentration on each of the outcomes when there are no family and student variables included in the statistical models. The net effect refers to the impact of poverty concentration on achievement and learning when the effects of family and student characteristics are statistically held constant. The first analyses presented for elementary school-aged students are based on estimates derived from achievement measured at two points in time, by grade. These analyses show whether the effect of school poverty concentration on achievement and learning during a one year period differs by grade. A second set of analyses is based on achievement measured at six points in time for students in grades 1 to 4. Examination of achievement and learning over a three year period provides an indication of the cumulative impact of school poverty concentration. Further, by conducting separate analyses for each grade cohort, it is possible to assess whether school poverty concentration changes as students progress through school. By conducting alternative analyses of the elementary school data (i.e., using single year data and three years of data) a number of counterintuitive results are obtained. However, the general conclusions remain the same. Next, results from the sample of high school students are presented. After presenting the effects of poverty concentration, the effects of the student and family variables in the equations are described. It is noted at this point, though, that in nearly all cases the estimated effects of the student and family variables are in the hypothesized directions.

Elementary School Age Students

Gross Effects, Achievement Measured at Two Points in Time

Table 5 displays the gross effects of school poverty concentration on reading and math achievement and learning for elementary school-aged students. The estimation equations which yielded these results are shown in Table 6. The students in each grade refer to those in a specific grade during the first year of the Sustaining Effects Study. Examination of the gross effects of poverty concentration on achievement and learning shows that in all grades there is a negative relationship between poverty concentration and both reading and math achievement. Only in grade 3 is there a negative effect of school poverty concentration on the rate of learning; that is, the rate at which students' math achievement changes between the fall and spring of grade 3 is negatively related to the level of school poverty concentration. Students who are in grade 3 and in high concentration schools learn at a lower rate than those in low concentration schools.

Finding that poverty concentration influences achievement in the fall and spring but not learning between these two points in time appears to be a contradiction. That is, how can poverty concentration influence fall and spring achievement and not the rate of change in achievement between the two time periods? To understand this finding I briefly return to the elements of the statistical model that are the basis of this result:

1. the effect of poverty concentration on fall achievement $=B_{2k}$,
2. the effect of poverty concentration on spring achievement $=B_{2k}+B_{4K}$, and
3. the effect of poverty concentration on the rate of learning $=B_{4k}$.

The empirical analysis of the SES data shows that the effects of poverty concentration on fall and spring achievement are statistically significant and negative in magnitude, yet there is a null effect on learning. The only way for school poverty concentration to influence fall and spring achievement and not the rate of learning is for the effect on fall (baseline) achievement to carry over to spring achievement. This shows that students in schools with high poverty concentration come into the academic year with initially low achievement and finish the year with achievement that is not significantly greater than that in the fall.

Before considering other results it is important to consider why school poverty concentration should have a large impact on students' basic reading and math skills during the fall of grade 1, a point in time where students have attended elementary school for only a few months at best. It may be that school poverty concentration is related to neighborhood and family characteristics or preschool attendance characteristics not included in the statistical model and thus, the relationship between school poverty concentration and grade 1 achievement in the fall may be a function of school poverty concentration serving as a proxy for other, unmeasured variables.

In Figure 1, the gross effects of school poverty concentration on reading and math achievement are plotted against grade level. From this figure it is possible to compare how the effects of school poverty concentration change as students progress through elementary school. The trend of the gross effects on reading achievement shows that the effect becomes increasingly negative between the fall and spring of each grade.

The effect of poverty concentration on math achievement over grade levels generally parallels the curve for reading achievement. Close examination of the trend lines shows that, initially, the impact of poverty concentration on reading achievement

is about equal to that on math achievement. By the fall of grade 2, though, school poverty concentration has a larger impact (at least numerically) on reading achievement than math achievement.

This trend--the effect of poverty concentration an students' achievement becoming increasingly negative--shows that there is a greater disparity in the achievement of students in high and low poverty concentration schools as they move through elementary school. That is, each year the gap in achievement between students in high and low concentration schools generally enlarges in each succeeding grade.

Net Effects, Achievement Measured at Two Points in Time

Table 5 also shows the net effects of poverty concentration on reading and math achievement and learning. The estimation equations are shown in Table 7. With respect to the estimated effects of poverty concentration on students' achievement and learning while controlling for family and student level variables (i.e., the net effects), it is found that in all instances, poverty concentration has a significant, negative impact on students' achievement and in no instance does it affect learning. More specifically, reading achievement in both the fall and spring are both influenced negatively by school poverty concentration for students in grades 1 through 6. On average, these estimates show that for each percentage point of increase in a school's poverty concentration, there is a decline of about one-third of a test score unit (VSS). Although this effect appears small, if one were to compare, for example, a student in a school with 10 percent of its students in poverty with another student that was in a school with 30 percent of its students in poverty, it would result in a difference of seven units in reading achievement, even if all other student and parent characteristics included in the model are equated. While this is by no means a large effect, it does indicate that even after taking into account student and family

characteristics, students' achievement in high and low concentration schools does differ to some extent.

In Figure 1, the net effects of school poverty concentration on achievement are plotted against grade level. In contrast to the gross effects, the net effects remain relatively stable over all grades. Only for reading achievement is there a small, but significant decline in the net effect of poverty concentration.

Gross Effects, Achievement Measured at Six Points in Time

The gross effects of school poverty concentration on achievement and learning using the three years of achievement scores for students in grades 1 to 4 are presented in Table 8. The estimation equations are specified in Table 9. In general, when student and family characteristics are not controlled, high school poverty concentration is associated with low baseline reading and math achievement scores. Further examination shows that the size of the effect of poverty concentration on baseline reading and math achievement tends to become increasingly negative from one grade to the next. This pattern similar to that observed in the analysis of the data for each grade in the first year of the SES.

Examination of the results in more detail shows that the gross effects of poverty concentration on changes in reading achievement over time are significant and negative for all four grade cohorts. Unlike the gross effects on achievement, the gross effects on changes in reading achievement (learning) are larger in the grade 1 cohort than in the later grade cohorts. For the grade 1 cohort it is estimated that the impact of school poverty concentration on reading learning is -.02. This indicates that if two students were compared, one in a school with poverty concentration of 30 percent and another in a school with 10 percent poverty, the reading achievement of the student in the school with high concentration after a three year period would be 14 points less than that of the student in the low concentration school. For the grade 3 cohort--the

cohort with the last significant effect--the effect is 50 percent smaller than the effect for the students in the grade 1 cohort (-.02 versus -.01).

Examination of the gross effects of school poverty concentration on changes in math achievement during a three year period shows mixed results. Only for students in the grade 2 and grade 3 cohorts are the effects significant and negative. For both of these grade cohorts the effects on learning for math are about the same size as for reading.

Net Effects, Achievement Measured at Six Points in Time

The net effects of poverty concentration on math achievement and reading are presented in Table 8. The estimation equations for the net effects are provided in Table 10. The net effects of school poverty concentration on baseline reading achievement are consistently negative for each grade cohort. For math achievement the significant, negative net effects are observed in both the grade 1 and grade 4 cohorts. Negative, but insignificant effects are observed in the grade 2 and 3 cohorts. As would be expected, the estimated effects are considerably smaller than the gross effects once student and family variables are statistically held constant.

The estimates from these models suggest that there is only limited evidence that school poverty concentration has a net effect on learning. Students who are in the grade 2 cohort and in schools with high poverty concentration tend to have smaller gains in math achievement than similar students in low concentration schools. In no other grade cohort does poverty concentration influence changes in reading or math achievement once student and family characteristics are taken into account.

The analysis of the single year data (i.e., achievement measured at two points in time) by grade, showed that poverty concentration had little net effect on changes in reading or math achievement over time. When three years of data are used to analyze changes in achievement, only a negative effect for poverty concentration on math is

observed for the grade 2 cohort. Additional analyses attempted to assess in what years there were significant gains in math achievement for the students in the grade 2 cohort. In these further analyses, it was assumed that achievement did not relate linearly to time. Rather, the growth model was structured in such a way that the learning trajectory could follow any curve. (The results are not provided in this report; rather, they are merely described in the text.)

The extended analysis shows that the only significant shift in cumulative achievement is observed between fall grade 2 and spring grade 4. All other changes from the baseline (fall grade 2) are not statistically significant. However, using spring grade 4 achievement as the point of reference and contrasting all prior measurement points with it, shows that poverty concentration significantly influences shifts in short- and long-term achievement. This finding suggests that poverty concentration has a large negative impact on math achievement measured in the spring of grade 4. Thus, the relative gap in math achievement substantially increases between students in high and low poverty concentration schools during grade 4 and not earlier grades.

High School Sophomores

Estimates of the gross and net effects of school poverty concentration on reading and math achievement and learning for high school sophomores are presented in Table 11. The estimation equations are shown in Tables 12 and 13, respectively. The gross effects are presented first, followed by the net effects of school poverty concentration.

Gross Effects

School poverty concentration has significant, negative effects on reading and math achievement during both students' sophomore and senior year of high school and has no influence on learning. The estimates of the gross effects for reading achievement show that for each percentage point increase in poverty concentration, there is a

corresponding decline of about .10 test units. Thus, contrasting reading achievement of a student in a school with say, 10 percent of its students in poverty with another student in a school with 30 percent of its student body in poverty shows that there would be a difference in achievement of .28 standard deviation units.

Examination of the gross effect of school poverty concentration on math achievement shows that a 20 percentage point difference in poverty concentration is associated with a difference in math achievement of more than .5 standard deviations.

Net Effects

After student and family characteristics are statistically held constant, there are substantial declines in the effects of school poverty concentration on reading and math achievement as a sophomore and senior. That is, the net effects are only about one-half as large as the gross effects. The pattern of the net effects is similar to that of the gross effects: senior estimates for achievement are somewhat larger, though, not significantly larger than the sophomore effects and the estimates of the net effects on math achievement are larger than those on reading achievement. Again, school poverty concentration does not influence learning.

Effects of Student and Family Variables

In this section of the report, the effects of the student and family variables on reading and math achievement and learning are briefly reviewed. This allows the reasonableness of the results to be checked. For elementary and high school aged students, the data show that elementary school aged girls have higher achievement than boys, and by high school, boys score higher than girls, particularly in math; blacks and Hispanics score below the non-black, non-Hispanic students; students whose mothers' work have lower achievement than those whose mothers' do not work; being in a large family or single parent family is associated with low achievement; having a mother with high educational attainment is related to high achievement scores and in a

number of instances, learning; in a number of instances low family income is associated with low achievement; and among elementary students "speaking a language other than English at home" is weakly, but negatively associated with low achievement. For the sample of high school sophomores, speaking a language other than English is positively related to achievement. This result is somewhat counterintuitive and may be a function of the measure of language use employed here. (High school students who indicated that either at home, or some point in their life they spoke a language other than English were considered as "speaking a language other than English".)

Summary and Conclusions

From the results of the research reported here, two general conclusions can be reached. First, both elementary and high schools with high poverty concentrations are differentiated from low concentration schools demographically and by the behaviors of students enrolled in them. Students enrolled in high concentration schools are more likely to be black or Hispanic, speak a language other than English, and to have low achievement. Further, the principals of high concentration schools are more likely to report that behavior of students is problematic than principals in low concentration schools.

Second, students in schools with high poverty concentration generally have lower achievement than those in low concentration schools even after taking into account student and family characteristics. However, there is sufficient variability in the rate of learning in reading and math between schools with high and low concentrations that in most analyses systematic differences in the rate at which achievement increases are not detected. When differences are observed, they are usually in the early grades of elementary school.

These results show that students in high concentration schools are in an environment that is less than ideal and tend to have lower achievement than those in

schools with relatively few students living below the poverty threshold. An important implication of the findings reported here is that, other than for students in the early grades, attending a school with a high poverty concentration will not necessarily put a student further behind in achievement than his or her peers in low concentration schools. However, students in high concentration schools will continue to remain behind their peers in schools with relatively few students living in poverty. Students in the early grades, however, may fall behind their peers during the first year or two if they are in a high rather than low concentration school. The data supporting this conclusion are rather weak and should be interpreted with some caution.

What are the implications of these findings for Chapter 1, and compensatory education more generally? First, the provision of directing funds to schools with high poverty concentrations and, in turn, educationally disadvantaged students is supported by the empirical evidence reported here. Second, it may be important to provide programs to students as they enter elementary schools. The results presented here show that students in high concentrations schools tend to enter with low reading achievement and quickly fall behind similar students in low concentration schools. After grade 1, the impact of school poverty concentration remains relatively constant.

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FIGURE 1. GROSS AND NET EFFECTS OF POVERTY CONCENTRATION ON READING AND MATH ACHIEVEMENT

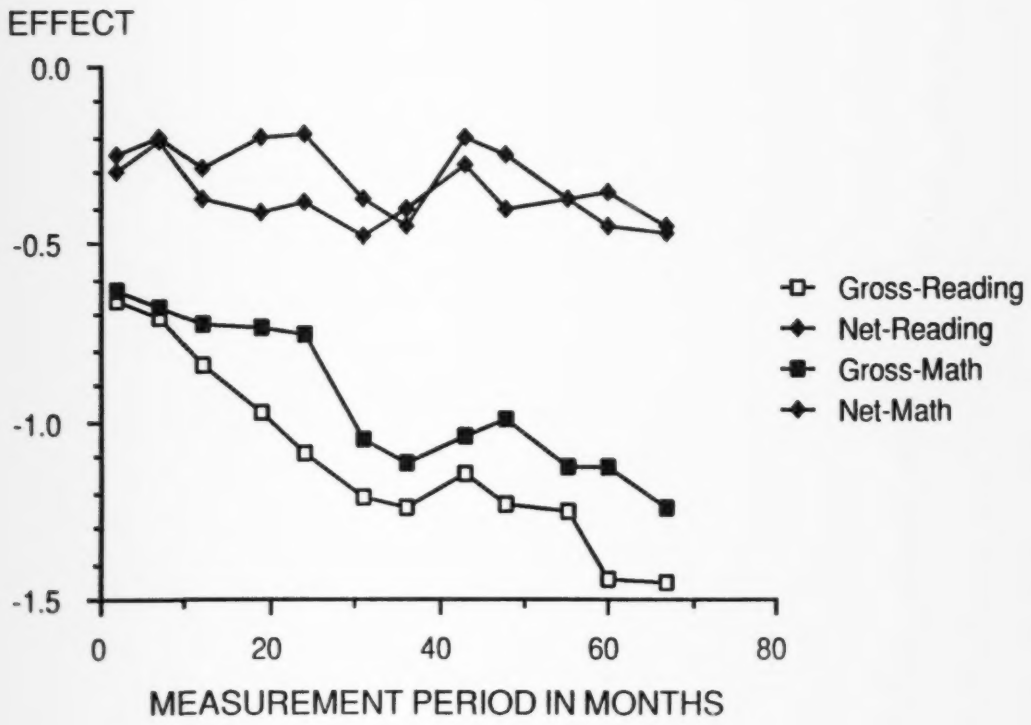

TABLE 1

Variable Descriptions: Elementary School Sample

Variable	Description	Mean	Standard Deviation
Title I	Coded as 1 if school is a Title I or Title I and other compensatory school, 0 if not. Derived from CER032.	.65	.48
Other CE	Coded as 1 if school is only an Other Compensatory Education School, 0 if not. Derived from CER032.	.23	.42
No CE	Coded as 1 if school has no Compensatory Education, 0 if not. Derived from CERO32.	.12	.33
Free Lunch	Percent of sample children in school who receive free/reduced price lunch. Derived from SBC007.	36.39	29.88
Student Mobility	Percent of students moved into school, plus percent of students moved from school, not exceeding 99.8. Equals PA039.	20.07	20.01
Extent of Vandalism	Coded as: 4 = a great deal, 3 = average amount, 2 = less, 1 = no. Equals PQ016.	2.95	.64
Extent of Physical Violence	Coded as: 4 = more, 3 = same, 2 = less, 1 = no. Equals PQA017.	3.03	.64
Title I Reading	Percent of sample children in Title I school who receive Title I Reading Services, or Title I and Other Compensatory Education in Reading Services. Derived from CER014.	14.14	16.80
Other CE Reading	Percent of sample children in Title I school who receive Other Compensatory Education Reading Services. Derived from CER014.	4.89	14.01
Title I Math	Percent of sample children in Title I school who receive Title I Math Services, or Title I and Other Compensatory Education Math Services. Derived from CER015.	7.65	14.93

Table 1 (continued)

Variable	Description	Mean	Standard Deviation
Other CE Math	Percent of sample children in Title I school who receive Other Compensatory Education Math Services. Derived from CER015.	4.54	15.74
Percent Title I	Percent of children in school receiving Title I services.	13.51	21.69
Percent Free Lunch	Percent of children in school receiving free lunch.	26.92	26.63
Percent White	Percent of sample children in school whose race/ethnicity is white. Derived from HQ062.	77.64	30.22
Percent Black	Percent of sample children in school whose race/ethnicity is black. Derived from HQ062.	13.57	25.24
Percent Hispanic	Percent of sample children in school whose race/ethnicity is Hispanic. Derived from HQ062.	6.25	15.81
Number of Parents	Coded 0 if two, 1 if one. Derived from HQ079 and HQ105.	.18	.38
Number of Siblings	Derived from HQ074, HQ075 and HQ076.	1.98	1.50
Mother's Educational Attainment	Coded 4 if grade 0-8, 10 if grade 9-11, 12 if a high school graduate with no further education, 14 if mother has some college, 16 if college graduate with no further education and 18 if mother has post-graduate degree. Derived from HQ106.	11.47	3.30
Gender	Coded 0 if male, 1 if female. Derived from SBC004.	.49	.50
Maternal Work	Coded as 1 if no, 2 if part-time (1-35 hours per week) and 3 if full-time (more than 35 hours per week). Derived from HQ111.	1.86	.89

Table 1 (continued)

Variable	Description	Mean	Standard Deviation
Family Poverty	1976 Orshansky poverty status. Coded 1 if poor, 0 if not poor. Derived from HQ201.	.17	.37
Poverty Concentration	Percent of sample children in school who are poor. Derived from HQ201.	17.59	17.60
White	Coded 1 if child is white, 0 if not. Derived from HQ162.	.77	.42
Black	Coded 1 if child is black, 0 if not. Derived from HQ162.	.14	.33
Hispanic	Coded 1 if child is Hispanic, 0 if not. Derived from HQ162.	.07	.25
Language Use	Coded 1 if child is in a household where a language other than besides English is spoken. Derived from HQ047, HQ048, HQ049, HQ050, HQ051, HQ052, and HQ053A.	.12	.34
Reading Fall	Vertical scale de-biased reading score of sample child. Derived from: Year 1 = CTBS010, CTBS030 Year 2 = CTBS006 Year 3 = CTBS006		
grade 1		347.49	35.15
grade 2		422.04	51.49
grade 3		465.91	56.05
grade 4		497.80	59.47
grade 5		533.43	65.91
grade 6		561.99	68.88
Reading Spring		512.34	87.64
grade 1		411.49	50.30
grade 2		466.80	53.76
grade 3		503.17	59.45
grade 4		528.57	63.77
grade 5		562.86	68.40
grade 6		591.26	72.62

Table 1 (continued)

Variable		Description	Mean	Standard Deviation
Math	Fall	Vertical scale math score of sample child. Derived from: Year 1 = CTBS019, CTBS039 Year 2 = CTBS009 Year 3 = CTBS009	468.72	103.48
	grade 1		334.15	35.52
	grade 2		397.92	43.70
	grade 3		445.06	48.72
	grade 4		495.60	55.49
	grade 5		549.65	65.29
	grade 6		581.03	68.92
Math	Spring		527.97	107.27
	grade 1		395.81	43.91
	grade 2		452.27	50.18
	grade 3		516.10	59.04
	grade 4		552.15	66.57
	grade 5		597.95	72.95
	grade 6		638.93	83.25

Note: The vertical scale scores for both reading and math achievement were derived from the raw achievement scores by using the conversion tables (see Tables A-25 to A-30) provided in the report by Hemenway, Wang, Kenoyer, Hoepfner, Bear, and Smith (1978).

TABLE 2

Variable Descriptions: High School Sample

Variable Name	Description	Mean	Standard Deviation
Family Poverty Status	Student poverty status (Census definition). Coded "1" if in poverty, "0" otherwise. Derived from BB101, BB096A, BB096B, BB096C, BB096D, BB096E, BB036B, BB036C, BB036D, BB036E, BB036G, BB036H, BB036I, BB036J.	.20	.40
Black	Coded "1" if Black, "0" otherwise. Black is derived from RACE.	.14	.35
Hispanic	Coded "1" if Hispanic or Spanish, "0" otherwise. HISPANIC is derived from RACE.	.18	.38
Number of Parents	Coded "1" if mother or stepmother is present and father or stepfather absent; "0" if 2 "parents" present. Derived from BB036B, BB036C, BB036D, BB036E.	.17	.37
Maternal Work During High School	Coded "1" if full or part-time work, "0" otherwise. Derived from BB037A.	.72	.45
Maternal Work During Elementary School	Coded "1" if full or part-time work, "0" otherwise. Derived from BB037B.	.63	.48
Maternal Work Before Elementary School	Coded "1" if full or part-time work, "0" otherwise. Derived from BB037C.	.46	.50
Number of Siblings	Coded as actual number of sibs. Adjusted sum of BB096A, BB096B, BB096C, BB096D, BB096E.	3.07	2.36
Gender	Student gender. Coded "1" if female, "0" if male.	.53	.50

Table 2 (continued)

Variable Name	Description	Mean	Standard Deviation
Mother's Educational Attainment	Coded as 2 = less than high school; 3 = high school graduation only; 4 = vocational, trade, or business school (less than 2 years); 5 = vocational, trade, or business school (more than 2 years); 6 = less than 2 years of college; 7 = two years or more of college; 8 = completed college; 9 = masters degree; and 10 = Ph.D., M.D., or other professional degree.	4.17	2.27
Language Use	Non-English language spoken at home, early in life, etc. Coded "1" if yes, "0" otherwise.	.20	.40
Physical Conflicts Among Students	The degree to which physical conflicts among students is a problem in the high school. Coded "1" if "not at all", "2" if "minor", "3" if "moderate", and "4" if "serious". Derived from SB056G.	1.91	.53
Conflicts Between Students and Teachers	The degree to which conflicts between students and teachers is a problem in the high school. Coded like SB056G. Derived from SB056H.	1.85	.51
Robbery or Theft	The degree to which robbery or theft is a problem in the high school. Coded like SB056G. Derived from SB056I.	2.22	.59
Student Absenteeism	The degree to which student absenteeism is a problem in the high school. Coded like SB056G. Derived from SB056A.	2.77	.77
Cutting Classes	The degree to which students cutting class is a problem in the high school. Coded like SB056G. Derived from SB056B.	2.57	.79
Participation in Title I	Whether a school participated in the Title I program. Coded 1 if yes, 0 if no.	.58	.49

Table 2 (continued)

Variable Name	Description	Mean	Standard Deviation
School Poverty Concentration	Percent of school's student body in poverty. Estimate is a weighted average of sophomore and senior samples. Derived from family poverty status.	21.25	15.11
Sophomore Reading Achievement--Baseline	Base year reading formula score. Derived from YBREADFS.	6.70	4.81
Sophomore Reading Achievement--Follow-Up	Follow-up year reading formula score. Derived from FYREADFS.	7.73	5.10
Sophomore Math Achievement--Baseline	Baseline year sum of parts 1 and 2 math formula score. Derived from YBMTH1FS AND YBMTH2FS.	13.97	10.83
Sophomore Math Achievement--Follow-Up	Follow-up year sum of parts 1 and 2 math formula score. Derived from FYMTH1FS and FYMTH2FS.	12.32	9.74

TABLE 3

Selected Characteristics of Low, Medium, and High Poverty Concentration Elementary Schools

Variable	Poverty Concentration			Eta[2a/]	F[b/]
	Low	Medium	High		
Extent of Vandalism	1.86	2.08	2.16	.03	3.63
Extent of Physical Violence	1.68	2.04	2.10	.07	8.71
Title I School	44.07	66.94	80.65	.08	9.72
Other CE School	37.29	22.31	11.29	.05	6.01
No CE School	18.64	10.74	8.06	.01	1.78
Percent Title 1 Reading	6.68	13.55	22.38	.11	14.88
Percent OCE Reading/T1 School	1.67	4.65	8.45	.03	3.65
Percent Title 1 Math	1.87	6.90	14.62	.09	14.42
Percent OCE Math/T1 School	1.08	5.28	6.38	.02	1.99
Percent Meeting T1 Criteria	5.56	11.00	25.95	.12	16.95
Percent Free/Reduced Lunch Criteria	10.64	22.09	51.82	.33	59.65
Percent White	94.57	82.26	52.50	.27	43.48
Percent Black	2.99	9.42	31.74	.19	28.01
Percent Hispanic	1.17	6.00	11.56	.05	6.88
Percent Language Other than English	5.81	10.88	19.37	.08	10.10
Student Mobility Rate	13.92	21.57	23.04	.03	3.91
Mean Reading Achievement (Fall)[c/]					
grade=1	353.93	347.19	339.17	.10	11.51
grade=2	445.55	422.62	397.88	.32	48.97
grade=3	490.62	463.40	442.01	.33	52.27
grade=4	527.14	497.41	470.61	.28	41.26
grade=5	561.31	533.16	506.25	.26	34.94
grade=6	577.07	558.50	524.80	.26	32.80

Table 3 (continued)

Variable	Poverty Concentration			2a/	b/
	Low	Medium	High	Eta	F
Mean Reading Achievement (Spring)					
grade=1	425.81	413.04	391.55	.18	22.76
grade=2	491.50	465.96	445.77	.29	41.88
grade=3	530.45	501.01	475.24	.35	56.38
grade=4	557.70	528.65	496.03	.31	47.20
grade=5	588.92	563.70	534.20	.24	31.33
grade=6	605.48	589.74	554.45	.22	26.99
Mean Math Achievement (Fall)					
grade=1	348.93	334.12	321.66	.24	34.07
grade=2	414.95	398.63	381.06	.25	34.94
grade=3	463.52	440.85	428.67	.24	33.81
grade=4	524.17	494.95	474.98	.28	40.83
grade=5	571.75	546.11	530.70	.18	22.43
grade=6	590.97	576.37	553.03	.13	14.55
Mean Math Achievement (Spring)					
grade=1	413.49	397.76	378.94	.25	35.76
grade=2	478.92	451.15	436.81	.23	31.48
grade=3	541.20	511.74	499.06	.23	31.09
grade=4	579.23	550.99	527.97	.22	28.71
grade=5	624.14	592.93	576.26	.18	22.28
grade=6	657.24	633.19	601.51	.15	16.05

a/ Eta^2 refers to the proportion of variation in a school characteristic accounted for by knowing if a school has low, medium, or high poverty concentration.

b/ F refers to the F statistic associated with a test of the null hypothesis that one or more of the group means differ from one another.

c/ At-level tests used in descriptive analyses.

TABLE 4

Characteristics of Low, Medium, and High Poverty Concentration High Schools

Variable	Poverty Concentration			Eta^{2} [a]	F [b]
	Low	Medium	High		
Physical Conflicts Among Students	1.78	1.88	2.09	.04	21.82
Conflicts between Students and Teachers	1.74	1.85	1.97	.02	11.80
Robbery or Theft	2.14	2.20	2.33	.01	6.75
Student Absenteeism	2.50	2.77	3.04	.06	30.95
Cutting Classes	2.44	2.55	2.76	.02	10.33
School Participates in ESEA Title I	42.47	50.79	73.01	.05	22.35
Percent of 10th Grade Students Taking Remedial Reading	7.74	10.86	21.59	.12	53.41
Percent of 10th Grade Students Taking Remedial Math	7.79	11.96	22.35	.10	40.58
Percent of Students White	80.63	71.20	31.98	.36	278.85
Percent of Students Blacks	5.16	10.33	28.94	.17	103.85
Percent of Students Hispanic	9.51	14.58	28.85	.17	102.22
Percent of Students Speaking Language Other than English	5.55	6.40	20.30	.10	50.56
Sophomore Math Achievement	16.02	12.30	7.65	.37	266.95
Senior Math Achievement	17.62	14.79	10.73	.37	267.07
Sophomore Reading Achievement	8.12	6.69	4.69	.35	247.78
Senior Reading Achievement	9.99	8.60	6.09	.37	265.08
Percent of Students Who Dropout	5.66	9.03	15.36	.12	64.24

a/ Eta^{2} refers to the proportion of variation in a school characteristic accounted for by knowing if a school has low, medium, or high poverty concentration.

b/ F refers to the F statistic associated with a test of the null hypothesis that one or more of the group means differ from one another.

TABLE 5

Regression Coefficients for Gross and Net Effects of School Poverty Concentration on Students' Achievement and Learning by Grade Level for Elementary School Aged Students: One Year Data

	Gross Effect		Net Effect			Gross Effect		Net Effect	
	b	t	b	t		b	t	b	t
Reading Achievement					**Math Achievement**				
Grade 1					Grade 1				
Fall	-0.66	-14.70	-0.30	-5.25	Fall	-0.63	-13.62	-0.25	-4.29
Spring	-0.71	-15.80	-0.21	-3.71	Spring	-0.68	-14.77	-0.20	-3.40
Learning	-0.05	- 0.83	0.09	1.10	Learning	-0.05	- 0.75	0.05	0.56
Grade 2					Grade 2				
Fall	-0.84	-13.78	-0.37	-4.99	Fall	-0.73	-12.57	-0.29	-3.98
Spring	-0.97	-16.01	-0.41	-5.58	Spring	-0.74	-12.75	-0.20	-2.77
Learning	-0.13	- 1.54	-0.04	-0.36	Learning	-0.01	- 0.10	0.09	0.86
Grade 3					Grade 3				
Fall	-1.09	-17.54	-0.38	-4.88	Fall	-0.75	-12.25	-0.19	-2.39
Spring	-1.21	-19.40	-0.48	-6.21	Spring	-1.05	-17.08	-0.37	-4.76
Learning	-0.12	- 1.41	-0.10	-0.90	Learning	-0.30	- 3.48	-0.18	-1.61
Grade 4					Grade 4				
Fall	-1.24	-15.71	-0.40	-4.24	Fall	-1.12	-13.97	-0.45	-4.57
Spring	-1.15	-14.61	-0.28	-2.98	Spring	-1.04	-12.92	-0.20	-2.05
Learning	0.09	.80	0.12	0.92	Learning	0.08	0.68	0.25	1.77
Grade 5					Grade 5				
Fall	-1.23	-15.28	-0.40	-4.09	Fall	-0.99	-11.63	-0.25	-2.37
Spring	-1.25	-15.54	-0.37	-3.80	Spring	-1.13	-13.30	-0.37	-3.50
Learning	-0.02	- 0.14	0.03	0.25	Learning	-0.14	- 1.16	-0.12	-0.84
Grade 6					Grade 6				
Fall	-1.44	-15.94	-0.45	-4.27	Fall	-1.13	-11.75	-0.35	-3.01
Spring	-1.45	-16.00	-0.47	-4.50	Spring	-1.24	- 9.18	-0.45	-3.91
Learning	-0.01	- 0.11	-0.02	-0.10	Learning	-0.11	- 0.84	-0.10	-0.59

TABLE 6

Regression Coefficients for Gross Effects by Grade: Elementary School Aged Students

Variable	Grade 1				Grade 2				Grade 3				Grade 4			
	Reading		Math		Reading		Math		Reading		Math		Reading		Math	
	a/ b	b/ t	b	t	b	t	b	t	b	t	b	t	b	t	b	t
Time	68.80	42.04	61.97	37.08	46.00	21.89	57.34	27.92	35.89	15.96	64.73	29.20	26.78	9.85	49.31	17.74
Poverty Concentration	-.66	-14.70	-.63	-13.62	-.84	-13.78	-.73	-12.58	-1.09	-17.54	-.75	-12.25	-1.24	-15.71	-1.12	-13.97
Poverty Concentration x Time	-.05	-.83	-.05	-.75	-.13	-1.54	-.01	-.10	-.12	-1.41	-.30	-3.48	.09	.80	.00	.68
Constant	359.83	310.92	347.26	293.86	439.33	289.37	410.73	282.86	488.91	307.44	463.11	295.47	524.98	272.94	522.68	265.89
R-square	.48		.42		.24		.31		.22		.32		.15		.22	
N	4,388		4,388		4,054		4,054		3,998		3,998		3,764		3,764	

Variable	Grade 5				Grade 6			
	Reading		Math		Reading		Math	
	a/ b	b/ t	b	t	b	t	b	t
Time	27.31	9.76	47.96	16.23	25.06	9.76	41.50	15.23
Poverty Concentration	-1.23	-15.28	-.99	-11.63	-1.44	-15.94	-1.13	-11.75
Poverty Concentration x Time	-.02	-.14	-.14	-1.16	-.01	-.11	-.11	-.84
Constant	557.21	281.54	568.37	272.03	587.84	323.89	607.81	315.35
R-square	.14		.16		.12		.12	
N	4,066		4,066		5,090		5,090	

a/ b corresponds to the estimated regression parameters.
b/ t corresponds to the t-statistic for the estimated regression parameters.

TABLE 7

Regression Coefficients for Net Effects Model by Grade: Elementary School Age Students

Variable Name	Grade 1				Grade 2				Grade 3			
	Reading		Math		Reading		Math		Reading		Math	
	a/ b	b/ t	b	t	b	t	b	t	b	t	b	t
Time	50.82	8.13	58.08	8.92	42.24	5.30	45.46	5.78	37.95	4.42	50.64	5.87
Gender	6.34	4.06	3.62	2.23	15.18	7.43	2.78	1.38	11.07	5.11	2.85	1.31
Black	-16.53	-6.36	-14.22	-5.25	-9.93	-2.77	-18.84	-5.31	-31.89	-8.51	-24.23	-6.43
Hispanic	-7.25	-1.64	-7.23	-1.57	-8.26	-1.47	-19.87	-3.59	-24.97	-3.84	-16.91	-2.60
Maternal Work	-2.06	-2.24	-3.18	-3.32	-4.32	-3.57	-2.87	-2.40	-2.57	-2.02	-2.54	-1.98
Number of Siblings	-1.25	-2.15	-.16	-.26	-2.95	3.90	-1.06	-1.42	-1.99	-2.48	-1.42	-1.76
Number of Parents	.53	.21	.84	.32	-4.64	-1.39	-2.74	-.83	-7.15	-2.15	-9.15	-2.74
Mother's Educational Attainment	2.32	8.19	2.67	9.04	4.23	11.72	2.67	7.51	4.14	10.65	2.97	7.60
Family Poverty Status	-5.96	-2.17	-8.44	-2.95	-8.99	-2.51	-9.58	-2.71	-5.29	-1.40	-4.46	-1.17
Language Other than English	-1.89	-.58	-2.02	-.60	1.08	.26	2.00	.49	5.04	1.07	4.12	.87
Poverty Concentration	-.30	-5.25	-.25	-4.25	-.37	4.99	-.29	-3.98	-.38	-4.88	-.19	-2.39
Gender x Time	6.17	2.80	-2.71	-1.18	-1.27	-.44	.38	.13	-2.47	-.80	3.57	1.16
Black x Time	3.88	1.06	-6.48	-1.70	-4.74	-.93	-2.18	.43	-3.28	-.62	-10.25	-1.93
Hispanic x Time	-8.85	1.41	-3.66	.56	-.68	-.09	13.51	1.73	2.45	.27	5.59	.61
Maternal Work x Time	-.65	-.50	.37	.27	1.87	1.09	.76	.45	-.61	-.34	-1.07	-.59
Number of Siblings x Time	-.21	-.25	-.86	-1.00	-1.12	-1.04	-.53	-.51	.03	.02	.15	.13
Number of Parents x Time	-6.11	-1.72	-4.81	-1.30	-1.09	-.23	-4.96	-1.07	-.68	-.15	2.97	.63
Mother's Educational Attainment x Time	1.37	3.42	.49	1.17	.24	.47	.88	1.75	.03	.05	1.12	2.02
Family Poverty Status x Time	-6.69	-1.73	2.34	.58	.95	.19	2.66	.53	.20	.04	1.08	.20
Language Other than English x Time	3.17	.69	1.79	.38	2.44	.42	-6.16	-1.07	-.65	-.10	-6.57	-.98
Poverty Concentration x Time	.09	1.10	.05	.56	-.04	-.36	.09	.86	-.10	-.90	-.18	-1.60
Constant	332.87	75.34	317.63	68.99	391.67	69.40	383.14	68.88	439.06	72.32	431.36	70.68
R-square	.55		.47		.35		.37		.33		.39	
N	4,164		4,164		3,888		3,888		3,804		3,804	

Table 7 (continued)

Variable Name	Grade 4				Grade 5				Grade 6			
	Reading		Math		Reading		Math		Reading		Math	
	a/ b	b/ t	b	t	b	t	b	t	b	t	b	t
Time	20.59	2.10	40.17	3.93	20.25	2.02	46.84	4.30	20.08	2.16	28.91	2.82
Gender	15.48	6.01	14.28	5.33	7.37	2.79	14.70	5.11	14.54	5.86	18.21	6.64
Black	-30.97	-7.27	-23.68	-5.34	-35.76	-8.04	-32.82	-6.80	-34.18	-7.39	-28.25	-5.54
Hispanic	-17.58	-2.54	-12.65	-1.76	-10.01	-1.29	-13.76	-1.63	-4.67	-.58	6.23	.70
Maternal Work	-1.73	-1.16	.13	.08	-5.46	-3.57	-3.54	-2.13	-5.93	-4.06	-4.63	-2.87
Number of Siblings	-3.16	-3.33	-.45	-.46	-4.72	-5.11	-1.06	-1.05	-5.92	-6.58	-1.80	-1.82
Number of Parents	-6.77	-1.70	-3.18	-.77	-8.11	-2.00	-8.18	-1.86	-5.19	-1.30	-4.77	-1.08
Mother's Educational Attainment	4.86	10.94	4.09	8.85	5.60	12.43	5.37	10.98	7.32	16.83	5.53	11.52
Family Poverty Status	-7.47	-1.71	-10.31	-2.27	-3.28	-.71	-4.63	-.92	-11.99	-2.66	-18.28	-3.68
Language Other than English	-2.46	-.49	.75	.14	-1.99	.34	7.41	1.15	-1.17	-.20	2.24	.35
Poverty Concentration	-.40	-4.24	-.45	-4.57	-.40	-4.10	-.25	-2.37	-.45	-4.27	-.35	-3.01
Gender x Time	-1.16	-.32	.74	.19	.90	.24	.82	.20	.91	.26	6.22	1.61
Black x Time	.87	.14	-7.16	-1.14	-2.98	.47	-1.63	-.24	.49	.08	5.53	.77
Hispanic x Time	-1.90	-.19	-6.64	-.65	-8.01	.73	-.40	-.03	5.67	.50	1.48	.12
Maternal Work x Time	-.34	.16	1.10	.50	.78	.36	-1.41	-.60	.83	.40	-.67	.30
Number of Siblings x Time	-.35	-.26	-.73	-.52	-.24	.18	-.87	-.62	.13	.10	.31	.22
Number of Parents x Time	-.34	-.06	-4.76	.81	-1.27	-.22	-1.50	-.24	3.63	.64	-2.16	-.35
Mother's Educational Attainment x Time	.64	1.03	.62	.95	.45	.71	.45	.65	.17	.27	.65	.95
Family Poverty Status x Time	.73	.12	1.46	.23	-1.47	.22	3.19	.45	-1.61	-.25	-1.00	-.14
Language Other than English x Time	1.56	.29	-.26	.04	3.64	.43	2.15	.24	1.48	.18	-.04	-.01
Poverty Concentration x Time	.12	.92	.25	1.78	.03	.25	-.12	-.84	-.02	-.10	-.10	-.59
Constant	464.85	66.87	464.11	64.15	503.11	70.96	502.32	65.25	512.91	78.02	543.59	74.93
R-square	.28		.30		.28		.27		.28		.23	
N	3,576		3,576		3,848		3,848		4,744		4,744	

a/ b corresponds to the estimated regression coefficients.
b/ t corresponds to the t-statistic of the estimated regression coefficient.

TABLE 8

Regression Coefficients for Gross and Net Effects of School Poverty Concentration on Students' Achievement and Learning by Grade Level: Three Year Data

	Gross Effect		Net Effect			Gross Effect		Net Effect	
	b	t	b	t		b	t	b	t
Reading Achievement					**Math Achievement**				
Grade 1					Grade 1				
Fall	-0.62	- 8.7	-0.41	-4.61	Fall	-0.46	-6.63	-0.22	-2.46
Learning	-0.02	- 4.12	0.00	-1.38	Learning	0.00	1.07	0.00	0.11
Grade 2					Grade 2				
Fall	-0.73	- 8.42	-0.35	-3.28	Fall	-0.41	-4.85	-0.03	-0.23
Learning	-0.01	- 2.93	-0.01	-1.22	Learning	-0.01	-3.21	-0.02	-2.94
Grade 3					Grade 3				
Fall	-1.08	-12.18	-0.46	-4.08	Fall	-0.74	-8.13	-0.01*	-1.45
Learning	-0.01	- 2.5	0.00	- .70	Learning	-0.01	-2.58	-0.01	-1.35
Grade 4					Grade 4				
Fall	-0.99	- 7.23	-0.32	-2.04	Fall	-0.85	-6.08	-0.33	-2.01
Learning	-0.01*	- 0.69	0.00	0.32	Learning	0.00	0.55	0.00	0.50

* Coefficient multiplied by 10.

TABLE 9

Regression Coefficients for Gross Effects for Elementary School Aged Students by Grade Cohort: Achievement Measured at Six Points in Time

	Grade Cohort 1				Grade Cohort 2				Grade Cohort 3				Grade Cohort 4			
	Reading		Math		Reading		Math		Reading		Math		Reading		Math	
Variables	b[a]	t[b]	b	t	b	t	b	t	b	t	b	t	b	t	b	t
Time	5.17	49.47	5.38	53.27	3.83	32.01	5.14	43.55	3.22	24.56	4.92	36.76	2.92	17.09	3.90	22.21
Poverty Concentration	-0.62	-8.70	-0.46	-6.63	-.73	-8.42	-.41	-4.85	-1.08	-12.18	-.74	-8.13	-.99	-7.23	-.85	-6.08
Poverty Concentration x Time	-0.02	-4.12	-.40[c]	-1.07	-.01	-2.93	-.01	-3.21	-.01	-2.50	-.01	-2.58	-.51[c]	-.69	.41[c]	.55
Constant	379.56	194.73	358.32	190.12	449.67	201.35	416.08	188.98	497.69	203.31	475.85	190.35	526.05	164.42	530.90	161.03
R-Square	.58		.62		.38		.51		.33		.45		.24		.32	
N	3,528		3,528		3,426		3,426		3,360		3,360		2,496		2,496	

[a] b corresponds to the estimated regression coefficient.
[b] t corresponds to the t-statistic of the estimated regression coefficient.
[c] Parameter estimate multiplied by 100.

TABLE 10

Regression Coefficients for Net Effects for Elementary School Aged Students by Grade Cohort: Achievement Measured of Six Points in Time

	Grade Cohort 1				Grade Cohort 2				Grade Cohort 3				Grade Cohort 4			
	Reading		Math		Reading		Math		Reading		Math		Reading		Math	
	a/ b	b/ t	b	t	b	t	b	t	b	t	b	t	b	t	b	t
Time	4.77	11.85	4.98	12.26	3.35	7.16	4.06	8.46	2.79	5.60	3.96	7.57	2.37	3.71	2.67	3.96
Gender	8.27	3.14	2.95	1.11	14.78	4.91	.77	.25	12.21	3.67	1.34	.38	19.37	4.51	11.53	2.54
Black	-9.15	-2.02	-13.59	-2.98	-11.17	-2.16	-15.57	-2.94	-29.90	-5.41	-19.44	-3.35	-24.81	-3.47	-23.18	-3.07
Hispanic	-9.44	-1.29	-9.60	-1.30	-10.39	-1.34	-28.78	-3.62	-27.57	-2.93	-7.48	-.76	-22.43	-2.27	-29.55	-2.84
Maternal Work	-.51	-.32	-.63	-.40	.17	.09	.27	.14	-1.72	-.89	-2.06	-1.01	2.04	.84	.51	.20
Number of Siblings	-2.02	-2.02	-.39	-.38	-1.94	-1.84	-.81	-.75	-2.09	-1.73	-1.10	-.87	-2.69	-1.76	.32	.20
Number of Parents	.14	.03	-.07	-.02	-3.71	-.72	-.10	-.02	-6.22	-1.21	-12.26	-2.27	-19.42	-2.60	-19.68	-2.50
Mother's Educational Attainment	2.51	5.06	2.34	4.68	4.55	8.14	2.57	4.47	3.87	6.64	2.79	4.56	5.17	6.76	3.87	4.79
Family Poverty Status	1.48	.28	.48	.09	-7.01	-1.36	-11.67	-2.20	.62	.10	-11.87	-1.89	-3.91	-.51	-1.86	-.23
Language Other than English	-6.33	-1.24	-2.24	-.43	2.28	.42	-1.43	-.26	-.08	-.01	-3.80	-.50	-13.49	-1.66	-13.73	-1.60
Poverty Concentration	-.41	-4.61	-.22	-2.46	-.35	-3.28	-.03	-.23	-.46	-4.00	-.16	-1.34	-.32	-2.04	-.33	-2.01
Gender x Time	.29	2.06	.18	1.26	.15	.95	.69	4.19	-.11	-.63	.53	2.84	-.16	-.71	.34	1.40
Black x Time	-.21	-.88	-.04	-.18	-.58	-2.11	-.21	-.73	-.02	-.08	-.15	-.49	-.06	-.16	.70	1.72
Hispanic x Time	-.37	-2.47	-.20	-.52	-.21	-.51	.31	.74	.34	.67	.44	.83	-.37	-.69	.37	.66
Maternal Work x Time	-.02	-.26	.07	.84	-.06	-.59	-.05	-.48	-.07	-.64	-.11	-.96	-.06	-.47	.07	.49
Number of Siblings x Time	-.13	-2.40	-.05	-1.00	-.03	-.60	.03	.44	.02	.34	.99c/	.15	-.67c/	-.08	.02	.19
Number of Parents x Time	-.15	-.61	-.17	-.69	-.16	-.56	.36	1.25	-.22	-.82	.25	.86	.43	1.07	-.11	-.27
Mother's Educational Attainment x Time	.04	1.48	.02	.80	.04	1.42	.06	2.02	.04	1.42	.06	1.97	.06	1.45	.07	1.58
Family Poverty Status x Time	-.35	-1.23	-.09	-.33	.27	.99	.22	.77	-.38	-1.20	.36c/	.01	-.47	-1.16	-.04	-.10
Language Other than English x Time	-.55	-2.02	.12	.44	.22	.76	.09	.31	-.15	-.40	.02	.05	.24	.56	.06	.13
Poverty Concentration x Time	-.65c/	-1.38	.51c/	.11	-.70c/	-1.22	-.02	-2.94	-.42c/	-.70	-.92c/	-1.46	.27c/	.32	.44c/	.50
Constant	349.00	46.46	329.55	43.46	388.73	44.55	385.74	43.03	450.14	48.33	446.69	45.66	454.80	38.14	479.27	38.08
R-square	.64		.64		.49		.56		.43		.50		.36		.40	
N	3,402		3,402		3,282		3,282		3,210		3,210		2,364		2,364	

a/ b corresponds to the estimated regression coefficients.
b/ t corresponds to the t-statistic of the estimated regression coefficient.
c/ Parameter estimate multiplied by 100.

TABLE 11

Regression Coefficients for Gross and Net Effects of School Poverty Concentration on Achievement and Learning for High School Aged Students

		Gross Effect	Net Effect
Reading			
Achievement	Sophomore	-.10**	-.04**
	Senior	-.11**	-.06**
Learning		-.01	-.02
Math			
Achievement	Sophomore	-.24**	-.12**
	Senior	-.27**	-.15**
Learning		-.03	-.03

* $p < .05$.
** $p < .01$.

TABLE 12

Regression Coefficients for Gross Effects
for High School Aged Students

Variable	High School Sophomores			
	Reading		Math	
	b	t	b	t
Time	1.51	6.73	2.76	6.13
Poverty Concentration	-.10	-14.41	-.24	-17.06
Poverty Concentration x Time	-.01	-1.25	-.03	-1.64
Constant	9.69	60.89	19.09	59.84
R-square	.09		.11	
N	5,750		5,750	

TABLE 13

Regression Coefficients for Net Effects Model:
High School Age Students

Independent Variables	Reading		Math	
	b[a/]	t[b/]	b	t
Time	1.32	2.92	2.64	2.94
Gender	-.29	-1.68	-1.48	-4.40
Black	-2.19	-6.75	-5.11	-7.96
Hispanic	-2.50	-9.20	-5.40	-10.05
Work During High School	-.36	-1.67	-.38	-.91
Work During Elementary School	.01	.07	-.48	-1.15
Work Before Elementary School	-.44	-2.30	-1.06	-2.79
Number of Siblings	-.21	-4.95	-.32	-3.82
Number of Parents	-.58	-2.21	-1.09	-2.08
Mother's Educational Attainment	.36	9.24	.71	9.09
Family Poverty Status	-.58	-2.33	-1.59	-3.24
Language Other than English	.58	2.38	1.34	2.79
Poverty Concentration	-.04	-5.87	-.12	-7.81
Gender x Time	.09	.38	-.39	-.83
Black x Time	.02	.04	.71	.79
Hispanic x Time	.31	.80	.09	.12
Working Before Elementary School x Time	.00	.02	-.30	-.50
Working During Elementary School x Time	.03	.09	-.13	-.22
Working During High School x Time	-.31	-1.14	-.46	-.86
Number of Siblings x Time	-.01	-.22	-.09	-.79
Number of Parents x Time	-.16	-.43	.16	.22
Mother's Educational Attainment x Time	.05	.90	.18	1.67
Family Poverty Status x Time	-.07	-.20	-.43	-.62
Language Other than English x Time	.00	.02	.42	.62
Poverty Concentration x Time	-.00	.88	-.02	-1.06
Constant	8.86	27.66	17.87	28.18
R-square	.18		.23	
N	5,750		5,750	

a/ b corresponds to the estimated regression coefficients.
b/ t corresponds to the t-statistic for the estimated regression coefficients.